

REGIONAL COMPETITION - ROUND 4

TOSS-UP

1. ERSC; Short Answer: Name the clay mineral produced by the alteration of potash feldspar which is also used in ceramics.

ANSWER: KAOLINITE

BONUS

1. ERSC; Multiple Choice: The black sand of the Hawaiian Islands is composed of which of the following?
 - a) dark limestone
 - b) quartz
 - c) gypsum
 - d) basalt

ANSWER: D -- BASALT

TOSS-UP

2. BIOL; Multiple Choice: The physical appearance and properties of an organism, also known as the expression of the genetic makeup, is called the:
 - a) phenotype
 - b) pangenesis
 - c) parental trait
 - d) genotype

ANSWER: A -- PHENOTYPE

BONUS

2. BIOL; Multiple Choice: The complex of sugar polymers and proteins that are patchily distributed on the plasma membranes of animal cells is called
 - a) cellulose
 - b) chitin (pron: ky'-tin)
 - c) glycocalyx (pron: glii-ko'-ka-lex)
 - d) cytoskeleton

ANSWER: C -- GLYOCALYX

TOSS-UP

3. COMP; Short Answer: The following line is found in a BASIC computer program:

s = TAN(X)(read: S equals T - A - N - open parenthesis - X - close parenthesis)

In what units must X be expressed?

ANSWER: RADIANS

BONUS

3. COMP; Short Answer: When programming in BASIC, ASCII (pron: AS - KEY) code can be used to represent characters numerically. In ASCII the UPPERCASE letter Z represents what number?

ANSWER: 90

TOSS-UP

4. PHYS; Multiple Choice: Five coulombs of charge are placed on a thin-walled conducting shell. Once the charge has come to rest, the electric potential inside the hollow conducting shell is found to be:

- a) zero
- b) uniform inside the sphere and equal to the electric potential on the surface of the sphere
- c) smaller than the electric potential outside the sphere
- d) varying as one over r squared.

ANSWER: B -- UNIFORM INSIDE THE SPHERE AND EQUAL TO THE ELECTRIC POTENTIAL ON THE SURFACE OF THE SPHERE

BONUS

4. PHYS; Short Answer: A two farad and a four farad capacitor are connected in series. What single capacitance is "equivalent" to this combination?

ANSWER: 4/3 FARADS

TOSS-UP

5. GENR; Multiple Choice: Cystitis is the infection of which of the following?

- a) liver
- b) urinary bladder
- c) pancreas
- d) lung

ANSWER: B -- URINARY BLADDER

BONUS

5. GENR; Multiple Choice: You use a hydrometer to check the condition of the electrolyte in your car battery. It is actually measuring what property of the fluid?

- a) charge
- b) density
- c) temperature
- d) surface tension

ANSWER: B -- DENSITY

TOSS-UP

6. CHEM; Multiple Choice: This noncombustible liquid in its dry form is noncorrosive to common metals except aluminum. About 90% of all of this material that is manufactured goes into the production of chlorofluorocarbons. Is this substance:

- a) carbon tetrachloride
- b) methylene chloride
- c) hydrogen chloride
- d) methyl fluoride

ANSWER: A -- CARBON TETRACHLORIDE

BONUS

6. CHEM; Multiple Choice: A compound that contains two ring structures having one common carbon atom is known as a:

- a) nonpolar compound
- b) interstitial compound
- c) spiro-compound
- d) inner compound

ANSWER: C -- SPIRO-COMPOUND

TOSS-UP

7. ASTR; Multiple Choice: Refracting telescopes always contain which one of the following?
- a) mirrors
 - b) lenses
 - c) television cameras
 - d) film

ANSWER: B -- LENSES

BONUS

7. ASTR; Multiple Choice: Spectral line splitting due to the influence of magnetic fields is called:
- a) Boltzmann Effect
 - b) Zeeman Effect
 - c) Planck Effect
 - d) Zanstra's Effect

ANSWER: B -- ZEEMAN EFFECT

TOSS-UP

8. BIOL; Multiple Choice: Organisms with cells containing two sets of parental chromosomes are called:
- a) diploid
 - b) bisomal
 - c) haploid
 - d) autosomal

ANSWER: A -- DIPLOID

BONUS

8. BIOL; Multiple Choice: The type of gene interaction in which the effects of one gene override or mask the effects of other entirely different genes is called:
- a) linkage
 - b) mutation
 - c) pleiotropy(pron: ply'-ah-tropy)
 - d) epistasis(pron: eh-pis'-te-sis)

ANSWER: D -- EPISTASIS

TOSS-UP

9. MATH; Multiple Choice: What type of numbers are included in the real number line that are not included in the rational number line?
- a) whole numbers
 - b) integers
 - c) irrational numbers
 - d) fractional numbers

ANSWER: C -- IRRATIONAL NUMBERS

BONUS

9. MATH; Multiple Choice: What is the length of the body diagonal of a cube with each edge equal to 1?
- a) square root of 2
 - b) square root of 3
 - c) 1
 - d) 2

ANSWER: B -- SQUARE ROOT OF 3

TOSS-UP

10. PHYS; Multiple Choice: Three capacitors with different capacitances are connected in series. Which of the following statements is TRUE?
- a) All three of the capacitors have the same potential difference between their plates.
 - b) The magnitude of the charge is the same on all of the capacitor plates.
 - c) The capacitance of the system depends on the voltage applied across the three capacitors.
 - d) the equivalent capacitance of the system is larger than the largest individual capacitance.

ANSWER: B -- THE MAGNITUDE OF THE CHARGE IS THE SAME ON ALL OF THE CAPACITOR PLATES

BONUS

10. PHYS; Multiple Choice: For a parallel-plate capacitor with plate area "A" and plate separation "d", the capacitance is proportional to which of the following?
- a) A divided by d squared
 - b) A times d
 - c) A divided by d
 - d) d divided by A

ANSWER: C -- A DIVIDED BY D

TOSS-UP

11. CHEM; Multiple Choice: Which of the following elements would form an acid oxide with the formula XO_2 (read X-O-2) and an acidic compound with hydrogen with the formula H_2X (read H-2-X)?

- a) Sodium
- b) Magnesium
- c) Aluminum
- d) Sulfur

ANSWER: D -- SULFUR

BONUS

11. CHEM; Multiple Choice: It is believed that carbon-14 in nature is slowly generated by the action of:

- a) protons on carbon-12
- b) electrons on hydrogen
- c) cosmic rays on boron
- d) neutrons on nitrogen

ANSWER: D -- NEUTRONS ON NITROGEN

TOSS-UP

12. COMP; Short Answer: The following lines are found in computer code written in BASIC:

```
X = ASC("A") - 64 (read: A - S - C - open parenthesis - quotation  
mark - UPPERCASE A - quotation mark - close parenthesis - minus 64)  
PRINT X
```

What value is printed for X?

ANSWER: 1

BONUS

12. COMP; Short Answer: When you are writing a FORTRAN program in standard format and you want to continue a statement on the next line in what column number do you put a character?

ANSWER: COLUMN 6

TOSS-UP

13. BIOL; Multiple Choice: For which of the following creatures is fat the greatest percentage of body weight?

- a) termite
- b) blue whale
- c) zebra
- d) female lion

ANSWER: B -- BLUE WHALE

BONUS

13. BIOL; Multiple Choice: Which is false regarding freshwater fish?

- a) their blood is hypertonic to their environment
- b) they often actively take up salt
- c) they excrete urine hypotonic to the blood
- d) their gills actively excrete salts

ANSWER: D -- THEIR GILLS ACTIVELY EXCRETE SALTS

TOSS-UP

14. ASTR; Short Answer: What type of star has a relatively low effective temperature (3,000 to 4,000 Kelvins), and has a large radius-about 100 times that of the Sun?

ANSWER: RED GIANT

BONUS

14. ASTR; Multiple Choice: Which of the following statements is true for BOTH Saturn and Jupiter?

- a) both rotate faster than the Earth
- b) both rotate slower than the Earth
- c) only one rotates rapidly while the other rotates very slowly
- d) their periods of rotation are linked to their period of revolution

ANSWER: A -- BOTH ROTATE FASTER THAN THE EARTH

TOSS-UP

15. PHYS; Short Answer: A charged particle is moving in a UNIFORM magnetic field. If the direction of motion of the charged particle is parallel to the magnetic field, describe the shape of the charged particle's path.

ANSWER: STRAIGHT LINE

BONUS

15. PHYS; Multiple Choice: An infinitely long wire carries a current of three amps. The magnetic field outside the wire:

- a) points radially away from the wire
- b) points radially inward
- c) circles the wire
- d) is zero.

ANSWER: C -- CIRCLES THE WIRE

TOSS-UP

16. CHEM; Short Answer: In the filling of electron orbitals for the element sulfur, which has 16 electrons, the number of electrons in the 3p orbitals is:

ANSWER: 4

BONUS

16. CHEM; Multiple Choice: Of the following liquids, which is most dense?

- a) water
- b) gasoline
- c) acetone
- d) chloroform

ANSWER: D -- CHLOROFORM

TOSS-UP

17. ERSC; Short Answer: Name the extremely fine-grained, wind-blown clay particularly characteristic of the arid and semi-arid southwestern United States, Mexico and South America. This material was used by the southwestern Indians and Mexicans for constructing huts and buildings from prehistoric times.

ANSWER: ADOBE

BONUS

17. ERSC; Multiple Choice: Which of the following materials is the hardest?

- a) calcite
- b) silicon carbide
- c) topaz
- d) quartz

ANSWER: B -- SILICON CARBIDE

TOSS-UP

18. GENR; Short Answer: What is the subdivision in the Plant Kingdom comprising over 20,000 species of Mosses and Liverworts?

ANSWER: BRYOPHYTES (pron: bri'-eh-fites)

BONUS

18. GENR; Multiple Choice: The per capita birth rate of a population is known as its:

- a) mortality
- b) natality(pron: nay-tal-eh-ty)
- c) population density
- d) carrying capacity

ANSWER: B -- NATALITY

TOSS-UP

19. PHYS; Short Answer: The speed at which a wave propagates down a string is 300 meters per second. If the frequency of this wave is 150 Hertz, what is the wavelength of this wave?

ANSWER: 2 METERS

BONUS

19. PHYS; Multiple Choice: A standing wave is formed on a tightly stretched string. The distance between a node and an antinode is:
- a) $1/8$ wavelength
 - b) $1/4$ wavelength
 - c) $1/2$ wavelength
 - d) 1 wavelength

ANSWER: B -- $1/4$ WAVELENGTH

TOSS-UP

20. BIOL; Multiple Choice: During which phase of the cell cycle are normal components of the cell synthesized and assembled?
- a) the M phase
 - b) the G1 phase
 - c) the S phase
 - d) the G2 phase

ANSWER: B -- THE G1 PHASE

BONUS

20. BIOL; Multiple Choice: Which of the following is NOT a characteristic shared by most of the members of the kingdom plantae?
- a) they are multicellular
 - b) they are nonmotile
 - c) they possess bilateral symmetry
 - d) there is an alternation of haploid and diploid generations

ANSWER: C -- THEY POSSESS BILATERAL SYMMETRY

TOSS-UP

21. CHEM; Multiple Choice: Crystals of ice are:

- a) isometric
- b) tetragonal
- c) hexagonal
- d) orthorhombic (pron: or'-tho-rom'bic)

ANSWER: C -- HEXAGONAL

BONUS

21. CHEM; Multiple Choice: Vegetable oil is made into margarine through:

- a) halogenation
- b) partial hydrogenation
- c) methylation
- d) oxidation

ANSWER: B -- PARTIAL HYDROGENATION

TOSS-UP

22. PHYS; Short Answer: Assume a ray of light is incident on a smooth reflecting surface at an angle of incidence of 15 degrees to the normal. What is the angle between the incident ray and the reflected ray?

ANSWER: 30 DEGREES

BONUS

22. PHYS; Multiple Choice: An organ pipe that is open at both ends resonates at its fundamental frequency. Neglecting any end effects, what wavelength is formed by this pipe in this mode of vibration if the pipe is 2 meters long?

- a) 2 meters
- b) 4 meters
- c) 6 meters
- d) 8 meters.

ANSWER: B -- 4 METERS

TOSS-UP

23. MATH; Multiple Choice: A square matrix that has all zeros below the main diagonal is called:

- a) upper triangular
- b) singular
- c) lower triangular
- d) invertable

ANSWER: A -- UPPER TRIANGULAR

BONUS

23. MATH; Short Answer: Express the decimal number 27 in Base 16

ANSWER: 1B

TOSS-UP

24. BIOL; Short Answer: If a male who is heterozygous for an autosomal trait mates with a female who is also heterozygous for that trait, what percent of their offspring are likely to be heterozygous for this trait as well?

ANSWER: 50%

BONUS

24. BIOL; Short Answer: How many chromosomes per cell does a Down's Syndrome individual have?

ANSWER: 47

TOSS-UP

25. CHEM; Short Answer: What term describes the process when a solid phase changes directly to the gas phase?

ANSWER: SUBLIMATION

BONUS

25. CHEM; Multiple Choice: Which of the following elements can form the greatest number of covalent bonds?

- a) carbon
- b) nitrogen
- c) oxygen
- d) sulfur

ANSWER: D -- SULFUR
